NASA-TM-112335

NOT JUST ANOTHER CD

Interdisciplinary Field Data Could Advance Forest Ecosystem Studies

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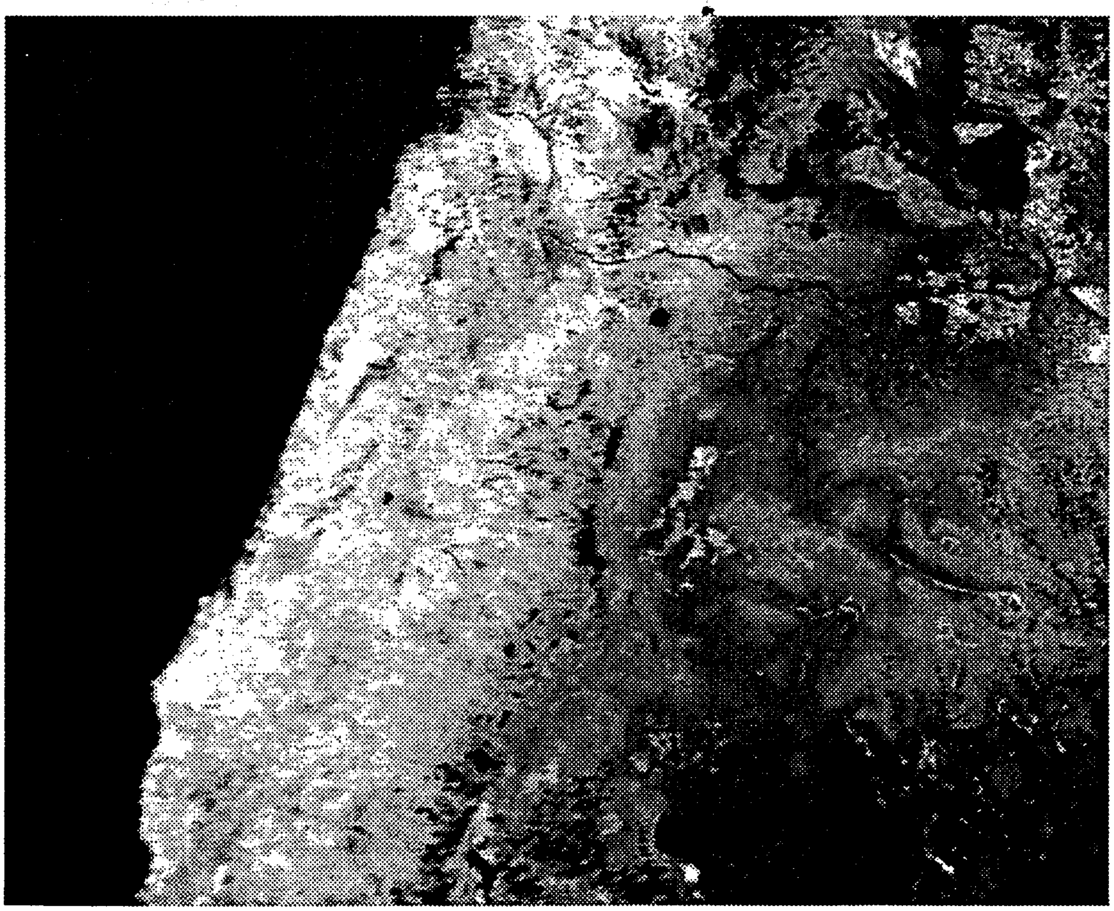
The first of a set of four CD-ROMs of data collected by the Oregon Transect Ecosystem Research (OTTER) project has been completed. The disc contains a coordinated set of satellite, aircraft, field, and laboratory measurements that were gathered during data collection campaigns and applied in the ecosystem research and modeling studies of OTTER project investigators.

The OTTER project

The principal objective of the OTTER project was to estimate major fluxes of carbon, nitrogen, and water through forest ecosystems using remotely sensed image data. More than 20 scientists from over 10 research institutions across the United States and in Canada participated in the testing and validation of the predicted fluxes and their biological regulation as simulated by ecosystem process models. Most data were collected in 1990 at six separate sites along an elevational and climatic gradient in west central Oregon to coincide with pre-budbreak (March), maximum growth (June), water stress (August), and senescence (October). Additional data were collected in the spring of 1991.

The bulk of the data collected for the OTTER sites consisted of remotely sensed imagery from instruments flown on satellites and on high-altitude and medium-level aircraft, such as NASA's ER-2, C-130, and DC-8. In addition, light and ultralight aircraft returned spatial, spectral, and video data. Satellite images for the project were registered composite Advanced Very High Resolution Radiometer (AVHRR) data generated by the EROS Data Center. The hundreds of aircraft flight



The following images have been extracted from the OTTER CD-ROM #1.

This image represents band 6 from the AVHRR instrument taken during June 1990 over Oregon. Note the Columbia River and the city of Portland. The OTTER transect runs west to east, from the coast inland, about one-fifth of the way from the top of the scene.

lines and scenes collected included data from the Advanced Solid-state Array Spectrometer (ASAS), Airborne Visible InfraRed Imaging Spectrometer (AVIRIS), Daedalus Thematic Mapper Simulator (TMS), NS001 TMS, and Thermal Infrared Multispectral Scanner (TIMS) instruments.

OTTER investigators used a variety of spectroradiometers to collect spectral reflectance measurements as ground truth for remotely sensed data. Other ground data collected include base station meteorological, soils, field sunphotometer, and ceptometer data. Data produced in the laboratory included various biochemistry, biophysical, physiological, and nutrient cycling measurements. Results from several simulation runs of a forest ecosytem model were retained, as well as data derived from mathematical calculations on raw data and from combinations of bands of raw data, such as leaf area index. The datasets collected for the entire project total nearly 16 gigabytes in volume.

CD-ROM contents

The image data collected from the C-130 aircraft (ASAS, NS001, and TIMS) on this and subsequent CD-ROMs were chosen to correspond to four times during the data collection periods. These times were 1) high sun, parallel to the plane of the path of the sun; 2) high sun, perpendicular to the plane of the path of the sun; 3) low sun, parallel to the plane of the path of the sun; and 4) low sun, perpendicular to the plane of the path of the sun. First, specific ASAS scenes with specific flight lines were chosen for inclusion on CD-ROM. Then, NS001 TMS and TIMS scenes were chosen so that they would have the same flight lines with the same sun angles.

Data for the aircraft imagery are provided for each of the six sites for the five data collection periods in 1990 and 1991. The disc contains one geo-registered AVHRR scene covering all sites for each month of 1990.

The OTTER imagery are provided in separate files in byte format for each individual spectral band with no header (except for the AVIRIS and ASAS scenes, which are stored in the format as distributed by the data providers). For example, there are 8 files of imagery for each NS001 TMS flight line, one for each band. In addition to the image files of Daedalus TMS, NS001 TMS, and TIMS, a file of housekeeping information is provided for each band with a summary file of calibration and other ancillary information for each scene.

OTTER tabular files of field and laboratory data, stored in ASCII format and containing mainly numerical data, were prepared for easy import into spreadsheet and database programs. The sunphotometer measurements can be used to correct the image data for atmospheric effects. The base station meteorological data, collected continually from 1989 to 1991, contain hourly measurements and daily summaries. Concentrations of several chemicals, such as sugar and starch, are given for several species on selected data collection days (during periods of aircraft overflights) for all sites. The data for one site, in which a portion was fertilized, is summarized over a monthly period in another file of chemistry data.

The data files on the CD-ROM follow many of the conventions and structures developed by the Planetary Data System (PDS). Each data file is accompanied by a descriptive PDS label file, which in the case of image data, permits easy display on personal computer systems. The public domain software package, "Imdisp," is provided on the disc for image display on IBM PCs (and compatible machines). The popular shareware program, "Stuffit," is necessary to extract the execution file for the Macintosh display program, "Image4PDS." All imagery, except for AVIRIS and ASAS data, can be displayed using the software on the disc. Complete documentation on PDS file formats as they relate to the OTTER data is provided on the disc.

General project documents on the CD-ROM describe the OTTER project, the precise location of the sites, the data collection campaigns, and each of the instruments/datasets. The disc includes files offering assistance in using the disc, such as a file describing the disc file naming conventions and an image index listing image files on the CD-ROM according to site, date and dataset name.

The remaining three CD-ROMs are scheduled to include the following datasets:

- Airborne SAR (Synthetic Aperture Radar)
- ASAS
- AVIRIS
- Compact Airborne Spectrographic Imager (CASI)
- Field Spectrometer Measurements
- Derived Data (such as Leaf Area Index)

This image of Cascade Head, Oreg. was taken using band 4 from the Daedalus Thematic Mapper instrument during June 1990.

- Forest-BioGeochemical Cycling Model Simulation Runs

The imagery selected for these discs will conform to the rules adopted for the first disc. Sampler images from the large format instruments, such as Airborne SAR, ASAS, AVIRIS and CASI will be generated to enable easy display of selected bands. The remaining discs are scheduled to be available in late 1993.

It is anticipated that the coordinated datasets on these discs will be useful for studies of seasonal forest ecosystem dynamics, in studies of carbon and water fluxes in temperate coniferous forests, and in the application of remote-sensing technology to help answer ecological questions. While a number of analyses of these data are to be published in special issues of two journals, the data comprise a valuable baseline for future studies of forest ecosystems.

Pilot Land Data System staff members at the Ames Research Center, under sponsorship of the Ecosystem Dynamics and Biogeochemical Cycling Branch of NASA's Earth System and Applications Division, produced the disc as one of the services of the ongoing support of the OTTER project. The PLDS staff prepared the data, documentation and all supporting files for publication and premastered the disc on the PLDS/Ames Sun server using Makedisc premastering software.

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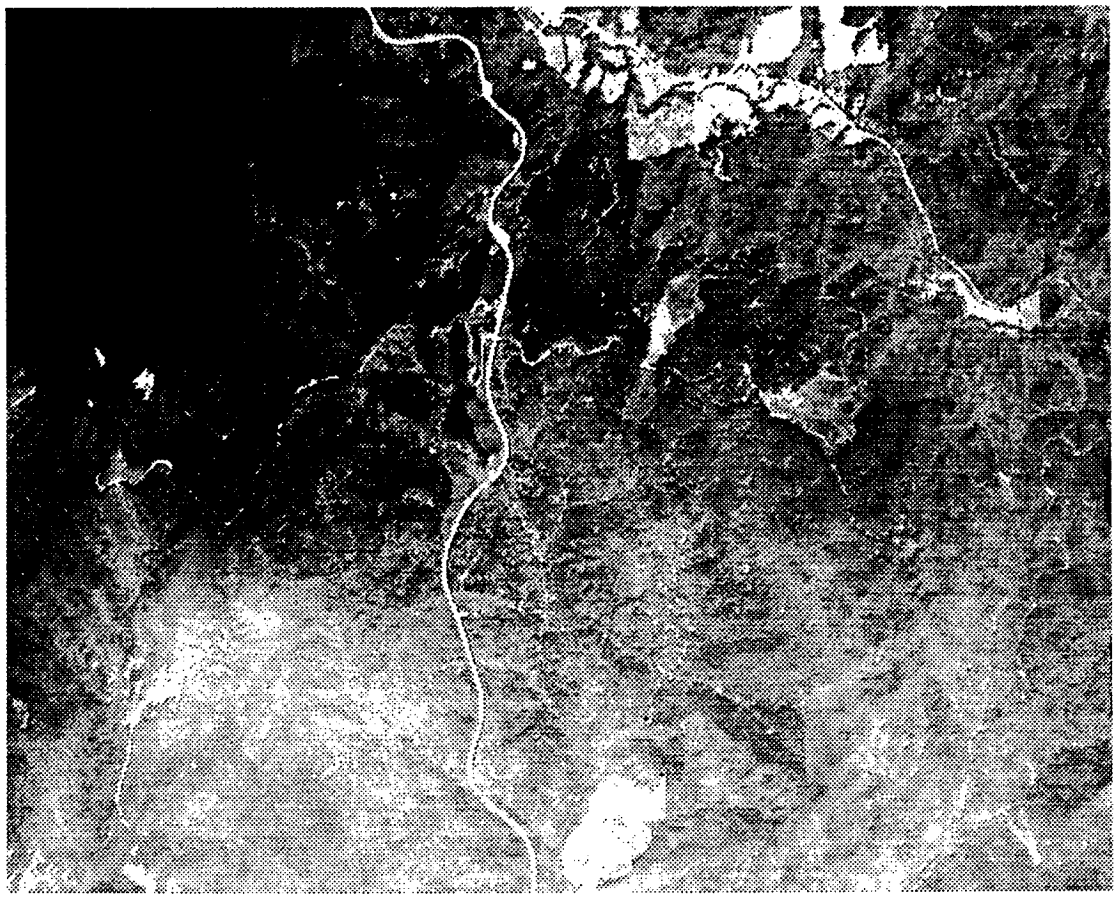

This scene of Cascade Head, Oreg. is from the Thermal Infrared Multispectral Scanner instrument (band 6) during June 1990.